

# Spiking Neural Networks (SNN) for bio-inspired stereovision

## Internship Brainchip/CerCo

### Description of Brainchip

BrainChip Holdings Ltd. ([www.brainchip.com](http://www.brainchip.com)) provides neuromorphic computing solutions, a type of artificial intelligence that is inspired by the biology of the human neuron. The company's spiking neural network technology can learn autonomously, evolve and associate information just like the human brain. The proprietary technology is fast, completely digital and consumes very low power. The company provides software and hardware solutions that address the high-performance requirements in civil surveillance, gaming, financial technology, cybersecurity, ADAS, autonomous vehicles, and other advanced vision systems.

### Internship's topic

Recent progresses in computational neurosciences used bio-inspired and unsupervised learning to develop artificial neural networks that become selective to the most frequent properties in their visual environment. Although these studies were very successful and currently constitute a gold standard in artificial vision, they were based on 2D images or videos whereas our surrounding environment is 3D. This 3D information is essential for multiple applications like depth estimation (e.g. for a robot to reach an object) or collision avoidance during navigation. It is therefore very important to develop bio-inspired artificial neural networks that integrate multiple visual inputs to exploit this 3D information.

Researchers in the Cerco laboratory ([www.cerco.ups-tlse.fr](http://www.cerco.ups-tlse.fr)) recently proposed a computer model based on stereoscopic vision that progressively develops selectivity to depth of objects in the visual scene (Chauhan et al., 2018). The aim of this internship is to build on this project to integrate such a solution on Brainchip's specific SNN neuromorphic hardware, improve the performances of the current model (e.g. efficacy, converging time) and extend its ability to other 3D properties (e.g. 3D motion). The internship will take place at Brainchip in collaboration with the Cerco. The candidate should have a strong background in computer science and wish to be involved in a multidisciplinary project that gathers a leading company in artificial intelligence and academic partners.

Reference: Chauhan, T., Masquelier, T., Montlibert, A., & Cottureau, B. R. (2018). Emergence of binocular disparity selectivity through Hebbian learning. *Journal of Neuroscience*.

### Expected skills for the candidate:

- Interest in the field of machine learning, in particular neural networks
- Appeal for interdisciplinarity
- Knowledge of Python. Notions of Matlab and C++ would be a plus.
- Reasonable English level

### Contacts

- Sébastien Crouzet – Research Scientist – [scrouzet@brainchip.com](mailto:scrouzet@brainchip.com)
- Benoît Cottureau – CNRS researcher – [benoit.cottureau@cns.fr](mailto:benoit.cottureau@cns.fr)
- Richard Chevalier – Director – [rchevalier@brainchip.com](mailto:rchevalier@brainchip.com)